

Remarks

The Interview

The undersigned and applicants greatly appreciate the time and courtesy of the examiner in interviewing this case on April 28, 2008. During the interview the undersigned and examiner discussed the attached amendment, the rejection under 35 U.S.C. § 112, second paragraph and the prior art. During the interview the Examiner agreed that the term “two sliding surfaces” was definite and that the objections to the terms “non-interactive”, “brush” and the structure of the “block copolymers” were moot in view of the attached amendment to the claims. However, the Examiner suggested adding a further limitation to state that the surfaces “slide against each other”. This phrase has been incorporated into independent claims 1 and 12, in accordance with the Examiner’s suggestion. Support for this amendment can be found in the specification at least at page 1, lines 11-12.

The Examiner agreed that the term “two sliding surfaces” in claim 12 requires that the two surfaces are in the same device or machine. He also indicated that this limitation overcomes the novelty rejections in view of Toshiaki, Murata, Hubbell, and Textor. The Examiner requested further explanations regarding the materials disclosed in Higai and Murata, which are provided herein.

Rejection Under 35 U.S.C. § 112, second paragraph

Claims 1-3, 5, 6, 8-10, 12, 16-18, and 21 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

Legal Standard

The test for definiteness under 35 U.S.C. § 112, second paragraph, is whether “those skilled in the art would understand what is claimed when the claim is read in light of the specification.” *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986). The fact that other language may be used in a claim is not a valid basis for a rejection under 35 U.S.C. § 112, second paragraph. The M.P.E.P. explains that the examiner's focus during examination of claims for compliance with the definiteness requirement “is whether the claim meets the threshold requirements of clarity and precision, *not whether more suitable language or modes of expression are available.*” (M.P.E.P. 2173.02, emphasis added) The M.P.E.P. further explains that “[s]ome latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire.” (*Id.*)

Analysis

The Examiner objected to the term “non-interactive” as a modifier for side chains. In response, Applicants have deleted this term from independent claims 1 and 12, and dependent claim 8. Applicants believe that it is proper for the present amendment to be entered since it

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places the claims in condition for allowance, does not raise any new issues, and does not require further consideration or search. The term “non-interactive” is not needed to define the side chains since they are clearly defined within the claims by the limitation that indicates that the side chains do not bind with the charged surface. Therefore claims 1-3, 5, 6, 8, 12, 16-18, and 21, as amended, are definite.

In his remarks, the Examiner indicated that claims 12-14, 17 and 18 are unclear. However, claims 13 and 14 were not listed in the formal rejection under 35 U.S.C. §112, second paragraph. As the Examiner notes, independent claim 12 defines a device or machine, and does not define a process. (*see* Office Action mailed January 9, 2008, at page 2, second to last para.) Claim 12 specifies that the device or machine comprises “two sliding surfaces”. Thus the term “sliding” modifies the noun, “surfaces”, and explains the relationship between the two surfaces. The phrase “two sliding surfaces” indicates that the two surfaces are in sliding relation to each other. The specification at page 9, line 30 until page 10, line 1 explains some of the benefits of placing a lubricating composition between two sliding surfaces. The specification notes that coating a surface with a lubricating composition results in a lower friction coefficient between two sliding surfaces under boundary lubrication conditions. The coating also protects the surfaces from wear, which can result from the sliding one surface against the other. While there may be other phrases that could be used to explain the relationship between the two surfaces in the claimed machine or device, one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification. As noted above, the test for indefiniteness is

whether one of ordinary skill in the art can understand the scope of the claim, not whether different or even more precise language could be used. Therefore claim 12 and its dependent claims are definite.

Further, Applicants have amended claim 12, in accordance with the Examiner's suggestion, to specify that the two sliding surfaces slide against each other. Support for this amendment can be found in the specification at least at page 1, lines 11-12. Therefore the claim as amended explicitly recites the interaction between the two sliding surfaces and is definite.

The Examiner objected to the term "brush" and the structure of the "block copolymers". In response applicants have deleted the structure of the copolymer from independent claims 1 and 12, which was previously added in the Amendment and Response filed October 16, 2007. Applicants believe that it is proper for the present amendment to be entered since it places the claims in condition for allowance, does not raise any new issues, and does not require further consideration or search. Since structure was not initially included in the claims, its deletion should not require further consideration or search by the Examiner. Therefore the Examiner's objections to the structure of the copolymer and term "brush copolymer" are moot in view of the amended claims.

Rejection Under 35 U.S.C. § 102/103

Claims 1, 5, 8-10, 12, and 21 were rejected under 35 U.S.C. § 102(a) as being anticipated by 35 U.S.C. § 102(a) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, JP 2002-060772 to Toshiaki ("Toshiaki"). Claims 1, 5, 12, and 21 were

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rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Patent No. 5,726,230 to Murata ("Murata"). Claims 1-3, 5, 6, 8, 9, 12, 16-18, and 21 were rejected under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Published Application No. 2003/0087111 to Hubbell *et al.* ("Hubbell"). Claims 12, 17, 18, and 21 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, WO 00/65382 to Textor *et al.* ("Textor"). Claims 1, 5, 8-10, 12, and 21 were rejected under 35 U.S.C. § 102(e or b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Patent No. 6,548,460 to Higai *et al.* ("Higai"). Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

The Claimed Methods and Devices or Machines

The claimed methods and devices or machines require a lubricating composition that contains an aqueous medium and a graft copolymer comprising a polyionic backbone that has a net positive or negative charge at neutral pH and side chains. The polyionic backbone adsorbs onto the charged surface to produce a lubricated surface, and the side chains do not bind with the charged surface. The presence of the lubricating compositions between the two sliding surfaces results in a lower friction coefficient between the two sliding surfaces than the coefficient of friction between the two sliding surfaces in the absence of the lubricating composition.

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The likely mechanism by which the lubricating composition is described in the attached paper, Müller, *et al.*, Tribology Letters, 15(4): 395-405 (Nov. 2003). Müller discloses that the charged backbone adsorbs onto the charged surface while the PEG side chains orient themselves away from the surface, stretching into the aqueous medium, incorporating water molecules and forming a brush-like structure. As the polymer chains stretch, they separate the two sliding surfaces and thereby lower the coefficient of friction between the two sliding surfaces. (*see* page 403, section 4.3) Thus, both components of the lubricating composition (graft copolymer and aqueous solution) must be present along with the two sliding surfaces for the required effect to occur.

As discussed below, the prior art references do not disclose or suggest the claimed methods or devices or machines. Some references, such as Murata and Higai, remove water from the compositions during a drying step. Further, none of the references disclose including a lubricating composition between two sliding surfaces in a machine or device.

Toshiaki

Toshiaki discloses coating water tanks and pipes with friction reduction agents prior to placing them underground to facilitate placement of the tanks and pipes in the soil (*see* para. 0001). Toshiaki does not disclose lubricating surfaces within a device, as required by claim 12 and claim 1, as amended. Claim 1 has been amended to specify that the two sliding surfaces slide against each other and are in a device or machine. Support for this amendment can be found in the specification at least at page 1, lines 11-12 and page 9, line 30 until page 10, 1 and

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page 10, lines 10-12. During the interview on April 28, 2008, the Examiner acknowledged that the contact between the outer surface of a pipe with the ground is different from a device that itself contains two surfaces, where the two surfaces are in sliding contact with each other.

Toshiaki's device is a pipe, which contains only an outer surface and an inner surface. However, these two surfaces are cannot be in contact with each other, let alone in sliding contact with each other. Thus, Toshiaki does not disclose the method defined by claim 1 or the device or machine defined by claim 12. Therefore independent claims 1 and 12, and dependent claims 5, 8 and 21 are novel in view of Toshiaki.

The claimed methods and devices or machines are also non-obvious in view of Toshiaki. As noted above, Toshiaki discloses applying coatings to an outer surface of a tank or a pipe and does not disclose or suggest placing a lubricating agent between two sliding surfaces within a device or machine, as required by claim 1 and its dependent claims. And, Toshiaki does not disclose a device or machine with two sliding surfaces, let alone including a lubricating composition on the surface of at least one of the sliding surfaces, as required by claim 12 and its dependent claims.

Further, Toshiaki discloses using different polymers, which form swellable gels, than the graft copolymers required by independent claims 1 and 12. Toshiaki's film reduction agent contains (a) a water-absorbing resin, (b) a hydrophilic binder, and (c) a solvent (abstract). Example 1 describes forming a water-absorbing resin containing polyethyleneglycol diacrylate and a crosslinking agent (*see* para. 0069). The reaction described in Example 1 formed a

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crosslinked polymeric gel, which swells in the presence of water. This copolymer does not have the structure required independent claims 1 and 12.

Additionally, Toshiaki explains that the solvent used when coating the tanks and pipes should be an organic solvent. Toshiaki explains that the solvent is used when coating the tanks and pipes should be an organic solvent to prevent swelling and thereby facilitate spreading of the friction reduction agent on the surface (*see* para. 0054). In contrast, independent claims 1 and 12 specify that the lubricating composition contains an aqueous medium.

One of ordinary skill in the art would not be motivated to modify Toshiaki to use a lubricating composition containing an aqueous medium and a graft copolymer, let alone place the lubricating composition between two sliding surfaces in a machine or device, as required by independent claims 1 and 12. Therefore, independent claims 1 and 12 and dependent claim 5, 8 and 21, as amended, are non-obvious in view of Toshiaki.

Murata

Murata discloses an aqueous coating composition that contains a particulate water-dispersible resin and an ester of a polyglycerin ether with a fatty acid dissolved or dispersed therein (col. 2, lines 1-4 and 11-15). Murata discloses coating a surface of a can; it does not disclose lubricating two sliding surfaces within a machine or device. Therefore independent claims 1 and 12 and dependent claims 5 and 21 are novel in view of Murata.

The claimed methods and devices or machines are also non-obvious in view of Murata. Murata applies the coating composition to a surface and then bakes on the composition onto the

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surface. Murata explains that during the baking process, the molecules crosslink and the ester of the fatty acid is fixed in the coating and serves to improve the lubricity of the coated surface (see col. 7, lines 5-17). As noted in the Examples at col. 13, lines 10-28, the coating compositions were applied to an aluminum panel or an aluminum foil, then allowed to set at a temperature of 100 °C and then baked at a temperature of 280 °C and a windspeed of 25 m/min, for the aluminum panel, or a temperature of 275 °C for the aluminum foil. Under these conditions, any water that was previously present in the coating would evaporate, leaving a baked-on coating. In contrast, the independent claims of the present application specify that the lubricating composition contains an aqueous medium and a graft copolymer. Thus, the aqueous medium must be present for the lubricating composition to function properly. One of ordinary skill in the art would not modify the baked-on coatings on a surface of a material for producing cans, as disclosed in Murata, to produce the claimed methods and devices or machines. Therefore, claims 1, 5, and 12 are non-obvious in view of Murata.

Hubbell

Hubbell discloses compositions for coating biological and non-biological surfaces to minimize or prevent cell-cell contact and tissue adhesion. The compositions contain polyethylene glycol (PEG)/polylysine (PLL) copolymers (abstract). Hubbell does not disclose or suggest methods for lubricating two sliding surfaces, nor devices or machines containing two sliding surfaces, whereat least one surface is a lubricated surface. With respect to coating non-biological surfaces, Hubbell indicates that these surfaces are “intended to be placed in contact

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with a biological environment.” (para. 0089) These are not devices or machines with two sliding surfaces that contact each other, as required by independent claims 1 and 12.

Further, with respect to the method claims, Hubbell applies the coating to one surface, such as the surface of a device (*see* para. 0094 and 0095). In contrast, independent claim 1 specifies that the lubricating composition is placed between two sliding surfaces that are in a device or machine. Therefore independent claims 1 and 12 and dependent claims 3, 5, 6, 8, and 16-18 are novel in view of Hubbell.

Hubbell’s compositions are designed to minimize or prevent cell-cell contact and tissue adhesion. A composition can be effective at preventing *adhesion* between two surfaces, as disclosed in Hubbell, but not be useful at *reducing friction* between two surfaces. For example, when one walks in sneakers on a side walk, there is a high friction coefficient between the sole of the sneaker and the side walk (which prevents one from slipping on the sidewalk), but the sneaker does not adhere to the sidewalk, *i.e.* low adhesion. In contrast, if water is placed between two flat glass surfaces, the glass surfaces will adhere to each other, *i.e.* high adhesion, but they will easily slide against each other, *i.e.* low friction coefficient. Therefore, the fact that Hubbell’s composition was known to prevent adhesion of proteins to a surface does not indicate to one of ordinary skill in the art whether this composition could function as a useful material in reducing the friction coefficient between two sliding surfaces. One of ordinary skill in the art would not be motivated by Hubbell’s disclosure to practice the claimed method for lubricating

two sliding surfaces or to form the claimed devices or machines. Therefore independent claims 1 and 12 and dependent claims 3, 5, 6, 8, 16-18, and 21 are non-obvious in view of Hubbell.

Textor

Textor discloses methods for improved analytical and biosensing devices. A copolymer, which contains a charged portion and non-interactive side chains, is coated or applied onto the surface of the analytical or biosensing device. The charged portion of the copolymer adsorbs onto the surface, while the non-interactive side chains form a dense structure that ***prevents the adsorption*** of molecules or ions onto the surface, making the surface resistant to non-specific adsorption of proteins. Further, Textor does not disclose devices or machines containing two sliding surfaces with at least one lubricated surface, as required by independent 12. Therefore independent claim 12 and dependent claims 17, 18, and 21 are novel in view of Textor.

Further, Textor does not suggest modifying its sensing devices to contain two sliding surfaces, let alone where at least one surface is a lubricated surface. Textor is directed at ***preventing non-specific adsorption on the surface*** of an analytical or sensing device. Modifying a sensing device to contain two sliding surfaces with a lubricating composition between the two surfaces could prevent the analytical or sensing device from being a useful sensor.

Further, as noted above with respect to Hubbell, the disclosure that a given material is effective at preventing the adsorption of proteins onto a non-biological surface does not provide one of ordinary skill in the art with any information regarding whether the same material could

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be useful as a lubricant. Textor contains no disclosure relating to how to reduce the friction coefficient between two sliding surfaces. One of ordinary skill in the art would not be motivated to modify Textor's analytical or sensing devices to form the claimed devices or machines, which contain two sliding surfaces. Therefore claims 12, 17 and 18 are non-obvious in view of Textor.

Higai

Higai discloses coating the surfaces of steel sheets to improve their press formability and corrosion resistance. The coated steel sheets are shipped to a customer, typically a manufacturer who uses them to form automobile parts; and the customer removes the coating using an alkaline solution (*see* col. 2, lines 12-14 and col. 6, lines 59-64). Therefore Higai does not disclose devices or machines containing two sliding surfaces where at least one of the surfaces is a lubricated surface or a method of lubricating two sliding surfaces in a machine by placing a lubricating composition between the two surfaces. Therefore independent claims 1 and 12 and dependent claims 5, 8, and 21 are novel in view of Higai.

The claimed methods and devices or machines are also non-obvious in view of Higai. Higai's method requires coating the steel sheet and drying the coating on the surface using a hot-blast dryer (*see* col. 2, lines 24-27; col. 14, lines 53-57 and col. 15, lines 1-3). Thus, like Murata, Higai's drying step removes water that may have been present when the coating was initially applied to the surface, allowing the coating to harden and adhere to the surface. In contrast, the independent claims of the present application specify that the lubricating composition contains an aqueous medium and a graft copolymer. Thus, the aqueous medium must be present for the

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lubricating composition to function properly. One of ordinary skill in the art would not modify Higai's method to eliminate the drying step to produce the claimed methods, which require placing a lubricating composition that contains an aqueous medium between two sliding surfaces in a machine or device.

Higai's coating composition includes a methacrylic resin. The methacrylic resin is formed by copolymerizing styrene or a substituted styrene, a methacrylic ester obtained from an alcohol with at least two carbon atoms and methacrylic acid and an olefinic compound with at least one carboxylic group (abstract). Optionally, the methacrylic resin mixed with or graft-copolymerized with a polyalkylene glycol ester of an olefinic compound having at least one carboxylic acid group to form the coating composition (col. 4, lines 12-37). However, neither of these coating compositions appear to improve the lubricity of the coated surface. Higai explains that lubricants are preferably added to the coating composition (*see* col. 12, lines 7-10 and col. 13, lines 13-18 and 40-43). Thus, additional lubricants are required to improve the lubricity of the coating. One of ordinary skill in the art would not modify Higai's coated steel sheets to produce the claimed machine or device, which requires a lubricating composition formed of an aqueous material and a graft copolymer. Therefore independent claims 1 and 12 and dependent claims 5, 8 and 21 are non-obvious over Higai.

Rejection Under 35 U.S.C. § 103

Claims 9 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hubbell in view of U.S. Published Application No. 2001/0049105 to Singh *et al.* ("Singh").

Although Applicants believe that claims 9 and 10 are non-obvious over Hubbell in view of Singh for at least the reasons discussed in the Amendment and Response filed October 16, 2007, this rejection is moot in view of the cancellation of claims 9 and 10 in the attached amendment.

Additional Amendments to the claims

Dependent claims 9 and 10 have been canceled. Independent claims 1 and 12 have been amended to specify that the polyionic backbone that has a net positive or negative charge at neutral pH. Support for this amendment can be found in the specification at least at page 6, line 32 and page 7, line 16. Claims 1 and 21 have been amended to specify that the side chains are formed by a polymer consisting of a first monomer (A), and the polyionic backbone is formed by a polymer consisting of a second monomer (B). Support for these amendments can be found in the specification at least at page 6, lines 3-4, 7-9 and 12-14. Claims 8, 22 and 24 have been amended to delete the term "non-interactive" in view of the amendments to claim 1, from which they depend directly or indirectly.

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Allowance of claims 1-8, 11-14, 16-18, and 21-25, as amended, is respectfully solicited.

Respectfully submitted,

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